MTM

Journal of Methods Time Measurement

In This Issue . . .

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9TH ANNUAL INTERNATIONAL MTM CONFERENCE

Sponsored by
METHODS-TIME MEASUREMENT ASSOCIATION

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The Journal of Methods Time Measurement

March-April
1960

MTM

MTM ASSOCIATION FOR STANDARDS AND RESEARCH

The Journal of Methods-Time Measurement is dedicated to the technical aspects, application development and general news items concerning the advancement of MTM.

The Journal encompasses the fields of endeavor that were formerly publicized in the MTM Newsletter and MTM Bulletin.

The technical section of the Journal is concerned chiefly with recent research developments both from the established research program at The University of Michigan, Ann Arbor, Michigan, and from somewhat smaller allied projects being conducted throughout the Association membership.

New applications of MTM as well as refinements of established applications are presented in the Application Section to illustrate specific approaches to management problems that can be solved through the use of Methods-Time Measurement.

Current events in the lives of persons associated with MTM are described in the general news section.

The Editorial Staff welcomes contributions for all three sections described.

MTM

The Journal of Methods Time Measurement
March-April 1960

MTM ASSOCIATION

Editor . . . . . Richard F. Stoll

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Editor's Note:

The Association has tried in every way possible to check the veracity of material published in the Journal of Methods Time Measurement. However, the opinions of the authors are not necessarily the opinions of the Association. The Association, therefore, will not be held responsible for any liability which may develop from any material in this publication.

MTM FEATURE

2nd INTERNATIONAL MTM CONFERENCE

Scheveningen Netherlands

MONDAY 25th APRIL, 1960

Plenary session: introduction, screening of film, forming of groups A (top management) and B (higher executives in charge of application of MTM).

9:00 hrs. Conference secretariat open for registration of participants and distribution of documents.

9:00 Reception (on special invitation) by the Council of the Nederlands MTM-Genootschap.

9:30-10:15 Conference opened by the President of the Nederlands MTM-Genootschap, Ir. R. F. Volz, followed by an address by Dr. H. B. Maynard, President of the International MTM Directorate. Dr. L. Gilbreth has also been invited to address the Conference.

10:15-10:35 Screening of film "Predetermined Time Systems" (made by Stichting Technisch Filmcentrum, The Hague, in co-operation with the European Productivity Agency).

10:35-11:00 Coffee break.

11:00-11:15 Division into groups under categories A (top management) and B (higher executives in charge of application of MTM) for the second day (see programme for Tuesday 26th April).

11:15-(12:30) Official reception by Municipality.

(12:30)-18:30 Excursion to Keukenhof, bulb fields and North Sea coast (lunch and tea at Keukenhof).

18:30 Return to Scheveningen Kurhaus. Dinner with members of the International MTM Directorate, followed by discussions in small groups:

Mr. G. Bohlin will lead the discussion on Coordination of Research;

Mr. G. R. A. Lapoirie will lead the discussion on Coordination of Public Relations;

Prof. W. Daentzer will lead the discussion on Coordination of Training;

Ir. W. B. Rueb will lead the discussion on Coordination of Qualifications.

(Dinner and drinks not included in Conference-fee.)

TUESDAY 26th APRIL, 1960

Simultaneous visits to enterprises and discussions in groups A and B. Participants will have grouped into categories A and B (see programme first day, 11:00) as follows:

Category A (top management) will visit a number of firms to exchange views on experience with MTM: economy, industrial relations, methods improvement and training.

Among others the following may be expected to act as hosts:

—Mr. P. J. M. Deiters (N. V. Berghaus Confectie—Clothing)

—Ir. A. Strachoff (Unilever)

—Ir. Yap Kie Han (Research Instituut voor Bedrijfswetenschappen—Research Institute for Management Sciences).

Category B (higher executives) will meet with executives from Dutch firms to exchange know-how of using MTM by examining applications on the spot in a number of firms in the Netherlands.

Forming these two categories is a possibility which, as you will understand can only be realized when participation will be sufficient, resp. not "splintered up" too much.

It is the intention to form working parties for several types of activity, to be selected—possibly the number (see below) increased if so desired—at a later date on the basis of participation in the working parties. Activities considered at present are:

1. chemical industry
2. clothing industry
3. electrical engineering (appliances)
4. printing industries
5. office management
6. manufacture of small metal products
7. general engineering
8. maintenance
9. shoe manufacture
10. textile industries
11. market gardening (horticulture)
12. packaging.

We imagine, that the discussions in the working parties be preceded by an introduction by one of the participants concerning a special subject, e.g., in

working party 2: a. clothing industry in Sweden;

b. manual for the clothing industry.

Further there will be subjects that come up for discussion in more than one group, viz.,

Use of Standard Data
Possibility of Quality Control
Special Cases of Work Simplification a.s.o.

Brief reports from these working parties will be presented on the third day of the conference, and more detailed reports will be printed in the proceedings of the conference.

Conference participants belonging to category A may of course attend group meetings of category B if they so wish.

WEDNESDAY 27th APRIL, 1960

Plenary session: papers, case histories and proceedings of the sectional meetings.

9:15 Coffee for invited guests.

9:30 Opening of second plenary meeting (categories A and B together) by the president of the Nederlands MTM-Genootschap, Ir. R. F. Volz.

10:00-12:30 Planned and suggested papers are:

"MTM in U.S.A. today" by Mr. D. W. Karger (U.S.A.)

"Problems of routine" by Dr. Ir. De Jong (Netherlands)

"Coding"

"Integral Use of MTM" by Mr. Evan Edman (Volvo, Sweden)

"MTM for training apprentices"

"Structure and Working method of the Swedish MTM Association" by Mr. G. Bohlin (Sweden)

Moreover there are promises for papers, received from:

Mr. Erik Biel-Nielsen (Sweden)
Mr. De la Fuente (Spain)
Mr. P. Fornallaz (Switzerland)
Mr. Pelissolo (France)

After definite determination of the number and kind of the working parties, these papers will be classified.

12:30-14:00 Lunch

14:00-17:00 Plenary meeting continued. Reports on the meeting of the International MTM Directorate and the group discussions in categories A and B.

15:45-16:15 Tea break.

17:00 Conference closed.

17:30 Social gathering (appetizer and a cold buffet).

MTM NATIONAL

APPLYING MTM TO THE UNUSUAL

by

Charles W. Linder
Oscar Mayer & Co.

The MTM program at Oscar Mayer & Co. is of recent origin. The program was started in April of this year and is therefore still in the development stage. As far as it is known, Oscar Mayer & Co. is the first company in the meat industry using MTM extensively.

A little background on Oscar Mayer & Co. may be helpful in appreciating the problems encountered. Oscar Mayer & Co. is generally recognized as the ninth largest Meat Packing Company in the United States. A total of six plants are operated, two of which have slaughtering as well as processing operations. Total plant employment is approximately five thousand. The products include all types of fresh and processed meats. Over 200 different items are produced. These vary from whole carcasses to three ounce self-service packages. The majority of all operations are on incentive.

The decision to use MTM at Oscar Mayer & Co. was made only after it was determined that it is of definite value in our operations. Practice studies were made in all departments and the results compared to known good time study standards. At the same time, studies were made to determine the value of MTM in estimating costs, making methods improvements and other related operations. The results of these check studies have convinced us of the merits of using MTM.

After it's usefulness was determined it was decided to expand the use of MTM and to incorporate it into the present system of time study for incentive and day work standards. MTM will not replace time study but will be used in conjunction with it. The Engineer will determine which method will work best in each situation. As the program progresses it is anticipated that greater use will be made of MTM.

A very ambitious MTM training program is being planned. Only four Engineers at Oscar Mayer & Co. are presently trained in the application of MTM. Of these only two have practical experience at the present time. The present schedule calls for presenting a 105 hour application training course to all Company Industrial Engineers within the coming year. When the training has been completed all Industrial Engineers will be equally proficient in MTM and Time Study. At the same time Foremen sessions in MTM appreciation will be presented. These sessions will be designed to familiarize the Foremen with MTM and to gain their confidence in the system.

Since most of you have never seen the interior of a meat processing plant, a short film was prepared to show a few representative operations. Note the wide range of operations, and the dissimilarity between these and other industrial operations with which you are familiar. Some of the points that you may want to note are:

1. The protective guards that are worn on the knife operations. On some operations these interfere with normal reaches and grasps.

2. The close tolerances on the scaling operation.

3. The wet and slippery floor conditions.

4. The care and tolerances maintained during the trimming operations.

5. The heavy weights moved without materials handling equipment.

Reprint from A. T. Kearney & Company, 1959 MTM Seminar.

Of the many different operations on which MTM has been tried, the majority have presented few problems. Among the operations on which MTM analyses were prepared with little difficulty were box staple, case packing, pallet loading, form rinsing, truck pushing, scaling, feeding canning machines, stuffing, and self-service assembly operations. It has proven especially useful on short repetitive operations.

The problems that have been encountered are due mainly to two reasons:

1. The difficulty of defining the method.

2. The difficulty of defining the controlling motion or the case of the motion.

When the first situation occurs the difficulty of defining the method is due to the lack of standardization of the raw materials or the variable conditions of the finished product. When the motion pattern varies from cycle to cycle because of the variability of the raw material one solution to the problem is to analyze each pattern and arrive at a frequency of occurrence for each. These variations, however, may be so numerous that slightly different variations in motion patterns occur each cycle. When this happens the possible solutions are:

1. Change or standardize the conditions of the raw material or product to conform to a definite method or limited series of methods.

2. Devise a method which discounts the variation in the raw material.

3. Use some other method for setting the standard.

Changing or standardizing the condition of the raw materials or products may be done in some previous processing step, or some type of selection, grading, or inspection process may be used to decrease the number of variations. Doing this makes it possible to analyze the motion pattern much more readily and accurately.

Devising one method or a group of methods which can be used under varying conditions is usually very difficult. Even if this is possible some concessions must be made which may eliminate the most desirable motion patterns. The difficulties that an analysis of this type would entail usually make the use of some other method of setting the standard a more desirable solution.

Constant efforts are being made to minimize the problem of variation. Machines and processes are constantly being devised and revised to produce a more consistent product. Such a program of necessity must begin with standardization of the raw materials in each step of the process. However, since there is a natural variation between animals, this problem will always exist to some degree.

The problem of defining the controlling motion or the case of the motion has occurred only in knife operations. These knife operations can be divided into the following:

1. Simple cutting
2. Straight line trimming
3. Contour trimming
4. Boning

The amount of control required and therefore the motion description is different in each case. Results of MTM analyses on these operations were checked against micro-motion analyses to arrive at the following conclusions:

1. Simple cutting or slashing is normally a "B" move. The move could become a "C" when the tolerance requires greater accuracy. Where this occurs the borderline between the first and second classification is being reached. The operation then becomes a trimming operation.

2. Trimming can be divided into two parts, straight line and contour trimming. A short straight line trimming is normally a "C" move. It may or may not be preceded by a position depending on the tolerance required.

3. No conclusions have been drawn as to the proper motion classifications on the remainder of the trimming and the boning operations. Some thought has been given to the problems involved and future work in this area is planned.

4. Due to the amount of control needed throughout the move, a case "C" move does not seem sufficient for long straight line trimming or for contour trimming where close tolerances are specified. Some of the possible controlling motion classifications are:

a. A series of short "C" moves.
b. A series of moves and positions.
c. A series of eye focus and eye travel times.

To-date very little work has been done to determine if any of these possible solutions apply.

5. The problems encountered in boning appear to be equally difficult. In addition to the problem of defining the controlling motion, differences in operator methods are apparent. Some operators use rather long moves while others use a series of short moves with approximately the same time requirement. In addition, hesitations were noted whenever bone or gristle was encountered. These may be equal in time to an AP2 but this has not yet been substantiated. All of these questions are yet to be answered.

While MTM has been found to be applicable in most of our operations, there are areas where some difficulty has been experienced. It is expected that eventually all of these problems will be solved and we will be able to apply MTM successfully to all operations. With MTM we expect to reap the benefits of more accurate standards, more accurate cost estimates, improved methods, and better method descriptions.

A NEW APPROACH TO LEVELING WORK SAMPLING

by

Daniel Markoff

Bureau of Supplies and Accounts

I. INTRODUCTION

The work sampling technique has been utilized for many years as a means of measuring activities and delays of man and machines while its use in the development of engineered performance standards is relatively new.

The work sampling approach to establishing performance standards is rapidly becoming an acceptable measurement technique. In the never ending stress for economy and with greater emphasis being placed on time and cost, work sampling appears to offer an economical solution to standard setting. The significant savings resulting from the use of work sampling, when compared with the more costly and time consuming techniques of time study and predetermined times, has aroused a great deal of enthusiasm for the application of this technique.

Advocates of this technique are convinced that, when performance is properly leveled, the standards established by work sampling will furnish the same results as those achieved through use of the more conventional and costly techniques. It is at this point that the skeptics challenge the validity of the performance rating or leveling as determined during the work sampling study. Admittedly, performance rating is a judgment factor which encounters much criticism when applied during the application of the time study technique. If the validity of performance rating can be challenged when conducting all day time studies, then it most certainly becomes questionable when determined at random intervals throughout the day. The questionable validity of leveling while conducting a work sampling study has been the greatest deterring factor in the widespread acceptance of the technique when used for establishing performance standards.

If the work sampling technique could somehow circumvent this controversial and questionable area of performance leveling, there would be less skepticism and greater acceptance.

II. NEW APPROACH DEVELOPED

A new approach to standard setting has been developed by the U.S. Department of Navy's Bureau of Supplies and Accounts. This approach combines the Methods-Time Measurement technique (a leveled predetermined time system) with Working Sampling. The merits of both of these techniques have been extracted and synthesized into a rather unique approach to establishing more reliable engineered performance standards.

An explanation of the underlying concept of this approach is quite simple. In order to circumvent the controversial aspect of leveling the work sampling standards, let us take advantage of the fact that MTM is already an acceptable leveled technique. After the work sampling standards have been established for all the jobs, a standard is then set for the most significant job by employing the MTM technique. The MTM standard then is compared with the Work Sampling standard for the same job. This comparison then furnishes an objective method of determining what the true leveling factor should be.

III. PROCEDURE

The application procedure for the new approach to standard setting is outlined below:

1. DETERMINE SCOPE OF STUDY: Will the study include a thorough job in methods engineering prior to the establishment of engineered performance standards or will standards be established on existing methods?

2. IDENTIFY AND CLASSIFY ALL JOBS PERFORMED IN THE ORGANIZATION: This information can generally be obtained from discussions or interviews with the supervisors; analysis of past production records; the preparation of a task list by all the workers; or by direct observation of the work performed.

3. PREPARE DETAILED SCOPES AND SELECT SIGNIFICANT WORK COUNTS FOR JOBS: This information can be obtained only by direct observation of the work as it is being performed by the worker.

4. SELECT THE MOST SIGNIFICANT JOB: This job is usually the prime function of the

organization or the job which entails the greatest expenditure of effort. This information can readily be obtained from an analysis of past records; the implementation and analysis of a task list; or a brief work sampling study.

5. CONDUCT THE METHODS STUDY: If the scope of the study includes a thorough methods analysis job, prior to the establishment of standards, it would be at this point in the procedure that the study would be conducted.

6. ESTABLISH AN "MTM MEASURED" STANDARD FOR THE MOST SIGNIFICANT JOB: Use Methods-Time Measurement (MTM), a leveled predetermined time technique, to establish an engineered time standard for the most significant job.

7. VERIFY VALIDITY OF "MTM MEASURED" STANDARD: It is essential that this standard be accurate since it will be used to level the work sampling study (this is a normal function of the methods engineer and presents no problem).

8. PREPARE TO ESTABLISH WORK SAMPLING STANDARDS FOR ALL JOBS: In preparing for the work sampling study, the following steps must be taken:

a. Design the Work Sampling Observation Sheets for the observer.

b. Prepare the Work Sampling Production Work Count Tally Sheets for the operators being observed.

c. Determine the number of observations required (usually a 5% margin of error at the 95% confidence level). The desired accuracy will determine the number of observations required.

d. Determine the length of the study.

e. Randomize the observations.

f. Select the observation points.

g. Orient the group being observed.

9. ESTABLISH WORK SAMPLING STANDARDS FOR ALL JOBS: (THIS WILL INCLUDE THE MOST SIGNIFICANT JOB PREVIOUSLY MEASURED BY MTM IN STEP #6): In establishing the work sampling standards, the following steps must be taken:

a. Conduct the work sampling study (take required observations).

b. Operators being observed must fill out the work sampling Production Work Count Tally Sheet daily while study is in progress.

c. Maintain accurate record of elapsed time for duration of study.

d. Summarize the work sampling Observation Sheets.

e. Summarize the work sampling Production Work Count Tally Sheets.

f. Determine percentage of effort expended against each job from summary of observation sheets.

g. Apply these percentages to elapsed time of the study to determine the expenditure of man-hours by job.

h. Establish work sampling standard for each job by relating the work units accomplished for each job (obtained step e above) with the man-hours expended.

10. DETERMINE LEVEL OF PERFORMANCE OF GROUP BEING STUDIED: The level of performance for the group can be determined by comparing the MTM measured standard for the most significant job with the work sampling standard for the same job. It is essential that all the workers in the group are working on the same jobs or standards for this principle of group performance leveling to be applicable. The basis for determining the performance level of the group (by comparing the MTM standard with the Work Sampling standard) is the fundamental principle that people will work at the same performance level on all jobs. An average operator can be expected to perform a "REACH OF 12 INCHES" in the same amount of time (assuming it is the same type of reach) regardless of what job he is performing (a basic principle of MTM).

11. ESTABLISHING LEVELED MTM BASED WORK SAMPLING STANDARDS FOR ALL THE OTHER JOBS: The performance level of the group can readily be converted to a leveling factor. Applying this leveling factor to all the other jobs being performed by the group will automatically and objectively (based on MTM) level all the other work sampling standards. See figure 1 for illustration of application of technique.

IV. APPLICATION OF TECHNIQUE

The illustration shown in figure 1 represents a paper work or clerical operation. This technique, however, will apply to any operation where a group of workers are all performing the same jobs. In this specific illustration, there were eight (8) distinctly different jobs being performed by the same group.

1. Standard #4 (Process Requisition) was selected as the most significant job being performed in addition to being the job which required the greatest number of man-hours to accomplish.

2. The "MTM Measured" standard for Process Requisitions was determined to be 25 requests processed per hour.

3. Work Sampling standards were then established for all eight jobs, including standard #4 (Process Requisitions). The "Work Sampling" (non-leveled) standard for Process Requisitions was determined to be 15 requests processed per hour.

4. The performance level of the group was determined to be 60% when comparing the "MTM Measured" standard for Process Requisitions with the "Work Sampling" standard for the same job (the Work Sampling non-leveled standard divided by the MTM Measured standard).

5. The leveling factor for the group was then determined by dividing the "MTM Measured" standard by the "Work Sampling" (non-leveled) standard. The leveling factor for the group was 1.67 or 167%.

6. The "MTM BASED" leveled Work Sampling standards were then determined for all the other jobs by multiplying the leveling factor of 1.67 by each of the non-leveled Work Sampling standards.

V. BENEFITS

The benefits of this technique and its impact on the field of engineered performance standards are of major significance since it incorporates the merits of both MTM (refinement and accuracy) and Work Sampling (reduction in time and cost). These benefits are listed below:

1. REDUCTION IN TIME AND COST: Depending upon the complexity of the organization being studied, comparable results can be obtained in approximately one third of the time required with the more conventional techniques of time study and predetermined times. This will put an end to the previously legitimate comment, "engineered performance standards are a valuable management tool—but—it is much too costly and it takes too long to obtain results".

2. AN ACCEPTABLE METHOD OF LEVELING WORK SAMPLING: With MTM as a base for leveling the work sampling study, the application of this technique will remove the aura of controversy which hovers over performance leveling and replace it with an objective and acceptable method.

3. NO SIGNIFICANT LOSS IN ACCURACY: When the technique is applied properly with competently qualified personnel, the results will provide accurate and effective standards produced at a minimum cost.

4. SIMPLIFY THE PROBLEM OF MAINTENANCE OF STANDARDS: The maintenance of standards in any dynamic organization in which changes occur quite frequently has caused havoc with many standards programs. The fact is that there has been no simple way of handling the maintenance problem. Whenever radical changes occur in either procedures, methods, layout, or equipment, invariably the entire range of standards previously set have to be re-worked. Thus the maintenance of standards has always been a very costly endeavor and has been the downfall of many programs. This new technique offers a simple solution to the problem at a substantial savings in time and cost. In the event of any radical changes occurring, the maintenance problem would be resolved in the following fashion:

a. The major job in the organization previously measured by MTM (if effected by the change) would be revised. This would require no significant amount of time, since most of the data previously developed by MTM could be used again.

b. Another work sampling study would be conducted and the technique of using MTM as a base for leveling work sampling would be repeated.

5. LESS COSTLY STAFFS OF METHODS ENGINEERS REQUIRED: Many organizations cannot afford the luxury of a large staff of methods engineers and conversely do not get involved with engineered performance standards. The application of this technique would require less numbers of qualified personnel. Each methods engineer could be augmented by a statistical clerk to conduct and summarize the work sampling studies.

APPLICATION OF TECHNIQUE

STD. NO.	JOB DESCRIPTION	WORK UNIT	PRODUCTION PER HOUR		LEVEL OF PERFORMANCE	LEVELING FACTOR	LEVELED WORK SAMPLING STANDARD
			MTM MEASURED LEVELED STANDARD	WORK SAMPLING NON-LEVELED STANDARD			
1	SORT INCOMING DOCUMENTS	DOCUMENTS		70			116.9
2	TYPE FOLLOW-UP LETTERS	LETTERS		5			8.4
3	PROCESS INVOICES	INVOICES		10			16.7
4	PROCESS REQUISITIONS	REQUESTS	25	15	60%	1.67	25.0
5	ADDRESS ENVELOPES	ENVELOPES		20			33.4
6	FILE FOLDERS	FOLDERS		30			50.1
7	STAMP DEALERS BILL	BILLS		100			167.0
8	FILE EAM CARDS	CARDS		50			83.5

SIGNIFICANT JOB (HEAVIEST EARNER IN HOURS)

MTM MEASURED STANDARD (SIGNIFICANT JOB)

WORK SAMPLING NON-LEVELED STANDARD (SIGNIFICANT JOB)

$L/P = \frac{WSN}{MTM} = \frac{15}{25} = 60\%$

$L/F = \frac{MTM}{WSN} = \frac{25}{15} = 1.67$ OR 167%

WSL = WSN X L/F = 15 X 1.67 = 25.0

KEY OR LEGEND	
L/P = LEVEL OF PERFORMANCE	MTM = MTM MEASURED LEVELED STANDARD
L/F = LEVELING FACTOR	WSN = WORK SAMPLING NON-LEVELED STANDARD
WSL = WORK SAMPLING LEVELED STANDARD	

FIGURE 1

MTM & INCENTIVE DISPUTE SETTLEMENT WITH UNIONS

Owen Fairweather
Seyfarth, Shaw, Fairweather & Geraldson

1. Elimination of the "leveling" argument

Wherever a collective bargaining relationship exists, it can be generally expected that production or incentive standards will account for a very substantial portion of the grievances which are filed by the Union. This is particularly true of incentive standards as opposed to day work standards. The reason, of course, is that incentive rates not only determine how fast or how hard an employee may have to work but also determine in large measure how much an employee is going to be paid. Since a sound incentive system requires constant revision of rates in order to keep up with method changes, incentive rates are a potential source of many grievances for an enterprising union.

Where incentive standards are set entirely by stop watch time study methods, the grievance will almost invariably center around the question of leveling or rating of the performance. Was the Operator working at 90% as the time study man claims or was he working at 125%, as the union claims. This becomes an extremely difficult question to resolve with the union because no one can prove that it was exactly one or the other. This is entirely a question of one man's judgment against another. It is an emotional issue in itself, since it involves the employee's pay, but it is particularly hard to resolve because any concession by the Company that the Operator was rated too low involves loosening of all the manual elements of the standard as well as the allowances which pertain to those manual elements. The entire standard, except for machine cycle or process time, is "up for grabs."

Ordinary stop watch time study methods with their necessary leveling judgments therefore create the following major problems in dispute settlements with unions:

1. They tend to center the entire argument concerning the fairness of the standard on the difficult question of the correctness of the time study observer's leveling of the performance; and

2. They expose all the manual elements and allowances to dispute and possible revision.

These basic problems of stop watch time study, of course, manifest themselves in many ways. Not the least frequent is the deliberate attempt by the Operator to slow down without detection by the time study observer. If his slowdown is detected and properly leveled by the observer, the union invariably argues that this was one of the best operators in the Company, and the operator, himself, swears that he was working at break-neck pace slightly in excess of a normal incentive pace. All of this, however, is only a manifestation of one or more of the basic problems just mentioned.

The use of MTM or other standard time data tends to narrow greatly the possible areas of dispute. First, it eliminates completely the leveling argument since the data is already leveled. True, another problem comes in to replace this leveling argument, but this problem is an easier one to lick. The argument which remains is whether proper elemental times have been selected for the various manual elements of the operation. This involves a much more narrow issue. Furthermore, the resolution of a dispute over the correctness of one element need not affect any other elemental time value. Therefore, any modification of a pre-determined time value in a standard can be made through the grievance discussions or an arbitration award without drastic loosening of the standard in most cases.

William Gomberg, one of the leading union experts on incentive problems, paid the following compliment to the use of standard time data:

> "On the other hand, where there is a macroscopic system of standard data in use, the job of the arbitrator is made that much easier. Although the elements may not be exactly additive in any combination, nevertheless their very existence acts as a stabilizer on the working environment and provides an emotional climate that encourages settlement of disputes."

Reprint from A. T. Kearney & Company, 1959 MTM Seminar.

2. Finding the best method through method analysis

One of the most aggravating problems in the labor relations field arises when the Company revises an incentive standard as the result of a method improvement initiated by an employee. Yet this situation arises so frequently in the industrial world that I have frequently encountered a union contract demand to the effect that the Company should not be permitted to revise an incentive standard except for method improvements initiated by the Company. Even in the absence of contract provisions prohibiting the Company from revising incentive rates because of employee initiated changes, unions will frequently take such cases all the way to arbitration, arguing that the Company is attempting to "cut" rates because of employee ingenuity. This makes a very emotional issue and it is not impossible for an arbitrator to err.

Obviously, the best way to minimize the occurrence of such disputes is for Management to find the "best method" before setting the incentive standard. This is a sound principle regardless of whether stop watch or standard data procedures are employed in setting the standard. I do believe, however, that the standard data technique should be superior in bringing about the best results in this area. Since MTM necessitates breaking down a task into its individual motion elements, it forces increased concentration on that method. This can and should bring about a greater concentration on finding the best motion pattern.

A side dividend of the MTM analysis is that a description of each elemental motion is made and recorded. This facilitates proof of the fact that a change in method has taken place where this may result from gradual small changes.

3. Union attitudes toward MTM

Since my previous remarks have indicated that the use of MTM analysis can greatly reduce the areas of possible dispute over production standards, some of you may conclude that labor unions should welcome such techniques with open arms. This is by no means invariably true. In fact, many of our most militant labor unions oppose the use of pre-determined time data with great vigor. They oppose it, not because of poor results, but because it removes from the area of collective bargaining a topic of great concern to unions.

To illustrate this union attitude, here are two statements made by Walter Reuther at different times:

> 1. "The ordinary stop watch time study involves use of a 'leveling' or 'rating' factor. This puts down a percentage figure which is supposed to indicate the degree to which the worker studied was performing faster or slower than some hazy idea of 'normal.'***"

and—

> 2. "A new scientific management system, known as Methods-Time-Measurement, is receiving wide publicity in management circles and efforts will undoubtedly be made to introduce it in the plant as a new and improved substitute for present time study programs. Its practical effect is virtually to abolish collective bargaining on production standards and piece rates."

So, even though Reuther criticizes leveling or rating factors as guesswork, it is obvious that he dislikes even more a system which eliminates the need for leveling. The reason for this, Reuther does not attempt to conceal. The union wants to bargain these matters.

THE USE OF MTM IN SETTING UP A NEW PRODUCTION LINE

W. J. Chamberlain
Kent Fabrics Corporation

Ladies and Gentlemen, MTM is a tool. It is a production efficiency tool that has many uses. One of the most important uses of this tool is that phase connected with production planning. The whole procedure of production planning is best based upon the MTM analysis. And as you all know, good planning is a prerequisite to successful production.

Therefore, this afternoon I would like to show you how we have used MTM in setting up a new production line, in fact, a new factory in Grand Rapids, Michigan. Let me start with some background information.

NEED FOR PLANT EXPANSION

Kent Fabrics Corporation is a manufacturer of infants' wear. We make plastic pants, bibs, crawlers, coveralls, sleepers, and topper sets. Many styles, sizes, and colors, with both staple and seasonal items, are involved. Last winter we had filled every square inch of the 50,000 square feet of production space in our Ionia Avenue plant and decided the time was right to acquire additional capacity. As a result of extensive research into the various angles one pursues in such an endeavor, we obtained a nearby two-story brick building containing some 40,000 square feet of good production space.

The plan was to move our basic plastic pants to this location, thus freeing space in the old building for the more complicated, space-consuming style items. The plastic pants are divided into two general categories: pull-on and snap-on pants. The layout was to be designed to produce 7500 dozen pull-on pants and 2500 dozen snap-on pants per 40-hour week. In this case we were moving two "going" items from one location to another. Thus, we had a lot of basic knowledge and experience with which to work.

To give the whole picture of MTM's part in setting up a new production line, I would like to assume for the moment that these items were new to us, and follow the procedures through, step by step in planning a sewing room to produce these items.

STEPS IN PLANNING A PRODUCTION LINE

I would list four major steps involved in planning a production line to produce a new item. They are:

I. Acquiring Basic Data
II. Completing Detailed Data
III. Computing Data for Machine and Personnel Requirements
IV. Making Production Line Layout

ACQUIRING BASIC DATA

Acquiring the basic data consists of gathering all information necessary to decide whether or not it is profitable to produce an item. MTM's part in this step is that of predetermining labor costs.

First, the sequence of operations of the garment is set up and reviewed from various angles. Study each operation to see if it can be simplified, combined, rearranged or eliminated. Consult the mechanic about folders, jigs, and other attachments. Check with the production manager about machines and equipment. Determine available equipment and investigate new equipment so that you can evaluate the best, most economical method to produce the item. Often the production manager will find things at this stage that the designer has managed to put together but that just cannot be done in highly repetitive production. This is the time to make any changes and iron out the real rough spots. Many times a simple change in construction will not hurt the styling of a garment but will make a great difference in ease of production.

A rough MTM analysis of each operation is made at this point. We use the Singer formula and standard data for this purpose because it is fast. Each operation is listed on a cost sheet with the corresponding piecework rate. One

Reprint from A. T. Kearney & Company, 1959 MTM Seminar.

important thing—this cost sheet is used as long as the item is made, so it must be kept up to date. Any time a price is revised it should be recorded on this sheet. Of course, many items never go beyond this first stage because they don't cost out.

Once an item has costed out and a decision has been made to put it into production, you can swing into the second step of planning.

COMPLETING THE DETAILED DATA

Review your previous MTM analysis of each operation to make sure it is accurate in every detail. In many cases you can use the rates obtained from your costing and will not need to make a complete methods analysis, but if it is anticipated that the item will be a high volume staple, I recommend a detailed methods analysis. If possible, set up one machine complete with attachments and tabling for each operation. Then have a utility MTM analysis of each job. This will give you a very accurate basis for setting your piecework rates and for further production planning. Keep in mind while analyzing the operation, that while the utility operator may be good, she is not going to have the proficiency in sewing a few items that the production operator will eventually acquire. The skillful analyst will take into consideration excess motions and fumbling at this stage. Here many rough spots will be found and ironed out in handling. These short cuts and methods should be put on paper and written into specifications for training operators in the correct method. Piecework rates are based upon definite motion patterns and if these patterns are not followed, the rate won't work.

COMPUTING DATA FOR MACHINE AND PERSONAL REQUIREMENTS

The next step in the production planning sequence is purely mechanical. Record each operation in order on an operation list. Behind each operation description, record the following data from the analysis sheet:

1. Standard allowed hours.
2. Standard dozen per 8 hours.
3. Type of machine and special attachments.

Then take the estimated required production per week and figure the number of machines and operators needed at standard. This will give you a balanced production line at the estimated production requirement if every operator works at standard production 40-hours per week. It is an excellent guide, a starting point; but your judgment is required to adjust these figures for absenteeism, new operator efficiency and turnover, machine down time, time allowed to reach estimated production, etc.

Now you have the necessary figures to begin the final step in the production planning sequence and can start laying out the production line.

MAKING PRODUCTION LINE LAYOUT

Efficient plant layout is dictated by the sequence of operations and the volume of work to be handled. The location of these operations in logical sequence, with adequate material handling facilities to permit natural, even flow of goods in varying quantities and kinds, and provision at suitable locations for auxiliary operations and service facilities, are essential requirements in any layout.

Space is generally the restricting factor in laying out a production line. Therefore, when laying out a production line, first make a scale drawing of the area in which you plan to produce the new item. Include in this drawing everything permanent—walls, posts, stairways, doors, elevators, lavatories, etc. Then make templates to scale, of all of the machines, tables, etc., that you have determined necessary from your list of machines and equipment. Arrange these templates in sequence on the space outline. Do not crowd things together on the layout, because my experience has been that one of two things happen when you go from the moving of templates to the moving of machines stage; either extra pieces pop up while you're arranging the machines, or you need more equipment to meet increased schedules after you're in production; or both. You will find several ways to lay out your production line, and each way will have its advantages and disadvantages. One trick I've found for remembering the different layouts is to take a picture of each one with a polaroid camera. If you don't have access to a polaroid camera, simply make a rough sketch of each set up as you go. Ask others in the organization for their ideas when comparing the different layouts. Everybody likes to give free advice and frequently they will come up with worthwhile ideas.

FACTORS FOR CONSIDERATION

When laying out a production line, some things that must be taken into consideration are: the permanency of the installation; future expansion; trucking and walking aisles; cut goods, work in process and finished goods space; parts supply

Conference Theme

MANAGING

2 DAY PROGRAM

MTM DOES NOT TAKE TOO LONG

You dont use standard data proper

START ON THE RIGHT FOOT — GE

DESIGN IT CORRECTLY—ECONOMI

MTM IS NOT RESTRICTED TO HIG

USE YOUR ENGINEERS AS ENGINE

Many Other

SPECIAL ONE DAY EXECUTIVE

COMPLETELY UTILIZE YOUR

IMPROVE LABOR MANAGEME

WITH SOUND WORK ME

A CONTROL PROGRAM TO AC

TOP MANAGEMENT SUPPORT

MEASUREMENT PROGR

CONTROL YOUR

IT'S THE 9TH ANNUAL INTERNA

IN SPRING

June 9 and 10, 1960

GING **MANPOWER**

LONG
properly
— GET TRAINED
NOMICALLY—THE FIRST TIME
O HIGHLY REPETITIVE OPERATIONS
GINEERS
Other Topics

IVE PROGRAM
OUR WORK FORCE
GEMENT RELATIONS——
RK MEASUREMENT PROGRAMS
TO ACHIEVE BETTER RESULTS
PORT FOR YOUR WORK
ROGRAM

UR LABOR COSTS

ERNATIONAL MTM CONFERENCE

IN TORONTO
King Edward Sheraton Hotel
Toronto, Ontario, Canada

areas for thread, elastic, labels, and binding; special tabling; and power rails, lights, heat, and ventilation. Of course, keep the distance between operations of the bulk of the goods to a minimum. Small parts lines of transportation can be longer, if necessary, since a large quantity of these parts can be moved at one time. All of these things have an effect on the efficiency of the operation and therefore reflect in varying degrees on the allowances you apply to the basic operation time when computing standard allowed hours.

CONCLUSION

Once you've chosen the best layout, all you have to do is make all of this planning work. MTM has provided an accurate basis for the whole planning process, and by applying this data correctly you have the start for successful production. When the plan is crystallized and has been agreed upon by the powers that be, see that it is followed through correctly. Disseminate the necessary information down the line and into the hands of the people on the firing line—the supervisor, personnel department, mechanics, cutting room foreman, purchasing agent, and all others who will help make your plan work. Minor changes are of course inevitable, so just make sure that any changes affecting the rates are reflected in proper rate changes.

All the planning in the world is a waste if it isn't followed through. My C.O. in the Air Force had a motto, actually he had many mottos, but his favorite was, "Plan Your Work and Work Your Plan." The work is just begun when you finish the planning stage, but it will be much easier and smoother if MTM has been one of your planning tools.

MTM NATIONAL

SPECIFICATION

ARTICLE Snap on Baby Pant	DATE October 12, 1958
STYLE NO. BP-2	THREAD 0 & 00 Nymo T
OPERATION Bind Sides	MACHINE CLASS 251-2
OPERATION NO. 3	R. P. M. 5,000
TICKET: Pink, All sections	S. P. I. 7

* * * * * * * * * * * *

1. Position bundle on left wing of table, with back end of pant closest to needle and inside up.
2. Pick up flap and position to pant.
3. Put under foot and sew to mark.
4. Trip clipper.
5. Put front side under foot and sew to mark.
6. Trip clipper.
7. Bring pant around and bind other front side. Trip clipper.
8. Pick up flap and position to other back side.
9. Sew to mark. Trip clipper.
10. Stack.
11. Two piles will be needed in stacking a bundle; and the bundle should be split in half so operator does not have to pick up from such a large stack.
12. Allowance has been made in the piece work rate for getting and disposing of work, clerical and changing binding.
13. Piece Work Rate: $.1359 per dozen.
    Standard per 8 Hours: 85 dozen.

MTM NATIONAL

ARTICLE: Snap On Baby Pant

STYLE: BP-2

DIRECT LABOR COST SHEET

OPERATION	RATE PER DOZEN	
DAY RATE		
Lay and Cut Film	$.02	
Slit 1 3/4" Film Binding	.015	
Slit Nylon	.015	
PIECE WORK RATE		
Bind Waist Elastic - Label	.101	
Bind Elastic to Legs	.104	
Bind Sides	.1524	10/10/58 .1359
Set Caps	.0542	
Set Studs	.0542	
Inspect, Box	.0624	
DIRECT LABOR	$.5782	$.5617

FORM E O 788 (1181)
PRINTED IN U. S. A.

ANALYSIS OF OPERATION

JOB NUMBER	DATE Oct, 1958	ANALYST WJC		OPER. No. 3		
OPERATION Bind Sides				SHEET 1 OF 1		
ARTICLE Snap on Baby Pant		S. P. I. 7	SIZE	STYLE BP-2		
MATERIAL Vinyl Film			THREAD 0 & 00 Nymo T			

MACHINE CLASS AND VARIETY	R. P. M.	THROAT PLATE	FEED DOG	FOOT	NEEDLE	ATTACHMENTS
USED 251-2	5000					Folders & Chopper
PROPOSED						

NO.	DESCRIPTION OF ELEMENT	TMU'S	NO.	DESCRIPTION OF ELEMENT	TMU'S
				SUB. TOTAL	
1	Pick up flap & position pant	75	14	Pick up flap & position to pant	75
2	Put under foot	40	15	Put under foot	40
3.	Regrasp	15	16	Regrasp	15
4	Sew 7" w/hesitate	39	17	Sew 7" w/hesitate	39
5	Trip clipper	7	18	Trip clipper	7
6	Pick up 2nd side & put under foot	60	19	Stack	40
					639
7	Regrasp	15		Bundle & Clerical allowance	17
8	Sew 7" w/hesitate	39			656
9	Trip clipper	7			
10	Pick up 3rd side & put under foot	65			
11	Regrasp	15			
12	Sew 7" w/hesitate	39		TOTAL NET HOURS PER PIECE	.00656
				S. A. H. PER doz (AT 20) % ALLOWANCE	0937
13	Trip clipper	7		PRODUCTION PER (8) HOURS	85.3
				COST PER doz @ $1.45 PER HOUR	.1359

SKETCH

Getting and disposing of work $\frac{1200}{120}$ 10

Clerical $\frac{375}{120}$ 3

Change binding $\frac{625}{144}$ 4

17

OPERATION LIST

ARTICLE Snap On Baby Pant (BP-2) DATE April, 1959

PRODUCTION 2500 dozen per 40 hour week JOB No.

	OPER. NO.	DESCRIPTION OF OPERATION	S. A. H. PER dozen	Dozen PER DAY 8 HRS. (std)	TYPE OF MACHINE	NO. OF MACH'S REQ'D	NO. OF OPER'S REQ'D
	1	Zig Zag Tops	0696	110	143W2	5	5
	2	Zig Zag Legs	0717	111	143W2	5	5
	3	Bind Sides	0937	85	251-2	6	6
	4	Set Caps	0387	200	Scoville AGS	2.5	2
	5	Set Studs	0387	200	Scoville AGS	2.5	2
	6	Inspect, Box	.0462	170	-	-	3
		TOTALS					

MTM INTERNATIONAL

HOW A COMPANY SHOULD PRESENT INFORMATION ON MTM

by

Kjell Strömberg
Director of Industrial Engineering, AB Bofors
An Address given at the Conference "MTM 1959" in Stockholm.
May 29, 1959

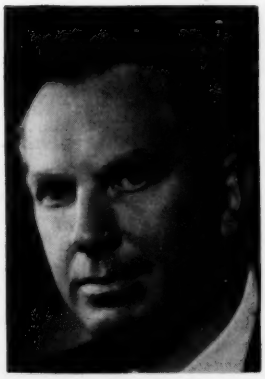
In every possible situation people are talking about how necessary information is. Perhaps the question may be raised why is information necessary? What is the purpose of information?

The fact probably is that knowledge about something disarms quite a number of unfavourable reactions. One may be anxious and uncertain about something new. One may perhaps be indifferent and not get involved. Or else one may work against the new things by starting to spread rumours that will thrive especially well where there is no factual information and knowledge about the things or circumstances in question. It is not said without reason that lack of knowledge is the mother of fear.

Another aspect on information is that evidently some people sometimes have sizable difficulties in making themselves understood and in talking in a way to really express what they wish to inform about.

Last but not least one has to take into consideration how much information it is necessary to give. Should one give brief and summarized information or should it be detailed and comprehensive? I once had reason to think this over in connection with MTM because the information supplied about MTM seemed to be detrimental. It gave rise to reactions that were of no good to the application of MTM. Trouble was caused by certain objections and resistance that appeared after the information meeting.

We also have to consider the fact that different persons apply different meanings to a concept. This means that we are to make special efforts to make o u r s e l v e s correctly understood.



The unfavourable reactions against the letter combination or conception "MTM" may simply be a result of insufficient information about the subject. In the case I mentioned—and where it was emphatically maintained that the information given was unfavourable to MTM—I believe that the information was insufficient. This probably applies also to the other reactions against MTM. One is ignorant of the fact that MTM can provide evident advantages also to the individual who becomes "subjected" to this type of work study.

I am inclined to believe that most important in MTM information is that it should be sufficiently comprehensive and that it should be presented in a language that is understood. There is hardly any risk to give too much information. There is, I believe, a natural overflow evacuation at an abundance of information. On the contrary, too little information may, in fact, cause problems.

What do people want to know about MTM?

One may raise the question if MTM demands some special information or if some

specific viewpoints should be applied to the information about MTM. I should say that this is really the fact. Special information is needed and this because the MTM technique is relatively new and because that this technique is rather unique—it is different. Today, we have stabilized the conception of work studies in the cost reduction field, but MTM is a variant and a new development in this field and is also substantially different. Also, it appears that the MTM method is of drastic and far-reaching effect when applied in major scale. It has a most extensive influence on productivity. It actively influences work organisation and work procedures. It causes a change in management routines by creating new ways to prepare and plan job methods in advance. And, not the least, it has substantial influence on the basis for incentive work.

Then, if we should take into consideration how the different categories in connection with MTM are looking upon this and, above all, what they should like to know about MTM, what is the answer?

The company management probably devotes its primary attention to possible results and possible costs—if it is profitable. What personnel is needed, how long a time is necessary to introduce the system, which organisational changes will it involve and in which sectors of company operation may the method be applied? Do I get advantages from using MTM in my company and in such a case in which parts of my production?

Plant and production management will probably want an answer to the question if MTM will influence the product design and how it will influence planning, process engineering and estimating procedures.

Production management naturally will ask what happens to productivity, production costs, organisation in production departments, production capacity and product quality.

The industrial engineers will have a long list of questions. They are the professionals who first of all will be affected and who will be most influenced by MTM. What is the production raising effect of MTM as compared to other methods? How is the profitableness of the methods improvement work influenced? How long time does it take to make MTM studies and to get results? More personnel and training now again? What does it cost? In which fields can I use MTM? What kinds of indirect effects will MTM exert on the operations bordering to the methods improvement questions as process engineering, tool and product design? And, above all, how reliable is the system?

The supervisory personnel want to know how this will influence their jobs, what will happen when MTM is introduced with resulting increase of work preparation. Does the worker need more service when on MTM incentives? How does it influence, in other respects, the organisation at the workplace? What is it that must be changed? And how does MTM influence piecework rates, will there be more negotiations, who will do the talking about the MTM rates? How will the workers react?

Next, one may consider how the workers react to MTM. From what one has heard from executives of the workers' organisations one can draw the conclusion that the attitude is a positive one so far that no one objects if the cake to be shared gets bigger. In principle, workers support measures that increase productivity. The local unions may put the question: "How will our members react?" They are more sensitive to local opinions. Will MTM cause irritation and inconvenience? And what about the wage development? Will we have the same possibilities to keep our wages moving upwards? And what will be the outcome on the contract side as concerns the formal contract questions and negotiations? And, finally, the individual worker. His natural question will be: "This is a very detailed system! Will I become a robot? Is personal freedom completely eliminated? Do I have possibilities to increase my earnings on the MTM piecework jobs as I did before? How does MTM influence the suggestion system? Are the methods absolutely fixed? Can I present suggestions for improvements of working methods also in the future?

Well, there you have quite a list of questions. Are we capable of giving such information that there will be satisfactory answers to all those questions and a positive attitude to the MTM method among all categories, then we have succeeded. My intention in this part of my address is to emphasize the extensive ramification of the MTM application and how important information consequently may be.

A practical example of information

After these speculative viewpoints I wish to proceed to report on how the information work on MTM has been pursued at Bofors Company, the enterprise by which I am employed.

Our first contact with MTM was more than

six years ago at an informative meeting with the company management where the MTM technique was discussed and what results one at that time believed could be attained by using this new aid.

In 1954 we started introducing MTM in the company and the first information on the employee level was given in a brief presentation of general content before the management-employee committee.

At the start no specific program was formulated, and it was only agreed that we would try out the method and keep all personnel categories informed on what would happen. Next, training was initiated as a first measure. A number of MTM technicians were trained in order to serve as human "cultures" for MTM thinking and future application of MTM methods. The labor union was invited to send representatives to participate already in the first training course, and two representatives of the Metal Workers Union joined it. Later, union representatives have been invited to every course.

During the first two years MTM was used exclusively to train people to be methods conscious and to serve as an aid in methods engineering and planning of new jobs. This was a maturing process. Every training course gave us more accumulated personnel trained in MTM, and we tried to spread MTM to all categories within the corporation in order to establish strongholds here and there. By and by the expectant attitude was turned into a positive interest to get something out of MTM. Thus, a spontaneous development in this field started at the Nobel plant, which for its ammunitions production developed a thoroughly thought-out and well organised process engineering department and a special methods engineering group.

When we had come that far and had so-to-say armed the personnel with MTM knowledge and MTM thinking, in the meantime having supplied infrequently general information on MTM and what was done elsewhere with MTM, etc., we were invited by the Volvo-Penta Co. to cooperate in the transference of their standard data for tool production. We thought it a most gratifying offer and did not hesitate to accept it. I can say that if at that time we had not been so advanced in MTM training and MTM information and thus prepared to accept the information in its full extent, we would have missed an excellent opportunity. It developed into a powerful injection in our MTM work and I shall give a brief account of this specific MTM installation and of the information supplied by us.

A new variant in cost reduction thinking

Before doing so I wish to mention something that we had developed in the meantime and which proved to be a most efficient supplement to MTM. Thus, we had formed a small group in our company in order to discuss a number of problems dealing with the designing of the workplaces, safety questions in connection with incentives, etc. The company physicians reported on some cases where the patient had suffered pathological changes and inconveniences due to overstraining of individual muscle groups. A mutual information between methods engineering people, safety personnel and physicians was regarded as a positive measure.

During the scrutinizing in the discussion group of all the viewpoints that could be applied to the designing of the workplaces and way of functioning a certain fixed program eventually was developed, that was expressed in the letter combination SEBA. The workplaces should be planned and designed in a way to meet all reasonable demands for safety (S), economy (E), i.e., they should be effectively arranged, bio-technological (human) merits (B), and aptness for work (A), i.e., they should be so well prepared in detail that the work would proceed without disturbances.

The original motives behind the deliberations were connected with the economic demands of the cost reduction work and with the necessity of not dropping the problems before the job was put on incentives and contracted with the union. In order to be fully safeguarded safety demands and medical demands had to pass the economic and practical purgatory.

The processing of all the inherent problems connected with the workplace, extended from the medico-physiological and bio-technological view, puts man in the centre. One is, in the first place, occupied with the worker and, for once, not the product and the machine (human engineering). The SEBA idea also has proved to be popular among the workers. Already on an early stage the union wanted information on the meaning of this combination of letters.

MTM in the repair-shop

After this parenthesis I shall return to the subject of the shop in which we are introducing MTM-based standard times. We are in the midst of this work but have seen so much of the result that we can give an account of the procedure. We choose to apply the standard times, for which

we were to receive the basic material from the Penta Works, in the machine processing workshop within the repair department at Bofors that manufactures spare parts for machine repairs. The production is sort of one-piece manufacture in very short series as in the case of tool manufacture. The machines are regular lathes, milling machines, drill presses, and grinding and planing machines in fairly small numbers—18 machine workers. The great advantage in choosing this very department was, however, that it was just about to be moved to other facilities, and thus we had an excellent opportunity to arrange the workplaces in an effective way without any real extra costs. Previously a system of estimated standard times had been used, and incentives in the real sense existed only sporadically. The level of earning was ordinary.

When we had decided on what would be done we started informing on this installation before the management-employee committee. Since long, the committee was well informed about MTM and knew that we were using it in methods work to an increasing extent. The workers' reaction in the committee was that we should thoroughly inform both the union, the local committee at the department and the individual workers about the whole problem. This was exactly what we had intended to do.

The workers participate in the planning work

At the initial information to the union committee about which workers, who would be involved by the installation, we suggested the workers to appoint a delegation that would join with the company's technical experts in discussing the entire planning of the new shop. Those operating the machines ought to know quite a lot about how things should be. They were not invited to be in on the decisions on how everything should be arranged. This was immediately received with appreciation. The delegation participated enthusiastically in the planning work and presented a lot of viewpoints that were accepted and realized.

At this stage the company physician and the safety organisation were taken into the picture. The economic (E) and aptness (A) viewpoints were considered already from the beginning. The next problem was to bring into consideration the safety (S), and bio-technological viewpoints (B) in order to arrive at a SEBA-marked workplace. This was, in the opinion of the workers, an additional interesting feature in the development, and the workers willingly participated in the review of all work operations made by the physician and the safety organisation.

Additional information and a study trip

During the continuance of the layout work and the SEBA analysis the information was started on MTM and the standard times that would eventually be the basis of the piecework rating. This part of the information was thorough and all who were to work under the new conditions got details on how the work would be organized, how it should be done, which tools and aids that would be supplied and how the piece rate was to be calculated for each job. This instruction in work and piecework rating on standard times also included a pilgrimage to the Mecca of MTM—i.e., a study trip to Volvo-Penta at Skövde. From what I have learnt this opportunity was carefully exploited by our new MTM adepts for questioning of their colleagues at the Penta Works on how they felt about working on MTM piecework.

During the autumn of 1958 the preparations went on for the moving of the machine processing workshop, and the cooperation group appointed by the workers participated in the layout and SEBA work. In the meantime the executives of the company were informed on how far we had proceeded in the preparations and what could be expected. Towards the end of the year we went into contact with the union for the purpose of making an agreement on the payment questions at the application of MTM standard data for piecework rating.

In February this year we had an additional meeting with the cooperation committee and informed them that now we were ready to start with the lathe group, viz., the first group of machines that had been moved into the new premises. The manual operations times for lathe work were processed and it remained for us to fix the machining times. These we could not take from the material supplied by the Penta Works just as they were. To a certain extent we were using other tools and other product material.

Testing of machines and tools

In cooperation with the shop laboratory for testing of machines, tools and processing qualities of materials we now made a thorough check-up of the condition of the machines and their tool equipment and capacity. After several tests and measurements we established guide values for the machining times that could be expected to be representative as averages.

Next, we arrived at a most important point in our information work. The rate setter who in the future would set the piecework rates for the lathe workers now personally made test operations on a series of jobs involved. This was done in connection with the testing of processing data in cooperation with the shop laboratory. He first calculated the standard time and then proved to himself in practice that the times were realistic. The workers were not accustomed to the high machining speeds that was tested and objected to their being used as a basis for the setting of pieceworks. However, the practical tests proved their value. Soon the workers had become accustomed to the new procedures and machining data.

The productivity per machine hour indicated approximately a doubling of the previous output. This is truly a drastic change, and it is easily understood that it might be difficult to accept such a fact. The whole of this increase was not a product of the standard times and the piecework system. The jobs were better prepared, a number of tasks having been removed from the lathe workers so that they could remain undisturbed at their machines. It might also be pointed out that no work studies had been made in the old workshop and that this substantial increase of productivity was achieved without a stop watch. We just skipped the entire stage of conventional work studies.

The final instruction

When we now were prepared to start operating according to the new methods and processing data all lathe workers received very detailed instructions about the method with which the work should be performed. These contained the motion patterns and the machine settings on which the times had been based and which aids we expected to use, e.g., dimension sketches, instructions, tools, and devices. Furthermore, the whole procedure was reviewed, how a job was prepared, how materials were procured and which papers and notations were necessary in order that the organisation would function without disturbances.

As an important supplement to these instructions every worker was carefully coached as to how he could use short-cuts in favourable situations, which pitfalls and mistakes that might appear in difficult cases, and how he could exploit the capacity of the machine and the tools in various situations, all this being practical advice and hints.

The MTM agreement

While this training of the workers went on the negotiations with the union were concluded and we arrived at an agreement both on base rates and transition provisions for the different stages of the installation. After that we were ready to start the first incentives and could begin operating MTM in practice.

The contact man

An interesting and important thing in this transition period was, I believe, that we accepted a suggestion by the union that the union committee chairman at this shop be relieved from his regular job as lathe worker and instead devote himself to the task of contact man for this installation. With retained salary he was granted permission to use his full worktime to ambulate among his colleagues, shop foremen and engineers and work study people to settle matters of all kinds. We have been greatly aided by this arrangement. A lot of detail discussions have been possible to keep between the workers and their own appointed representative, who also had obtained complete MTM training and thus was able to discuss details as an expert. The uncertainty before all the new that the workers may, naturally, feel in a situation like this, could now be relieved in a simple and direct manner.

After the lathe workers the milling-machine workers were next to follow.

Next, the remaining machine functions follow according to order. The result is very carefully followed up day by day, and every deviation from the calculations and every disturbance results in an investigation of the cause and a correction of the faults. The intimate contact and the fast actions have proved to be most favourable to the undisturbed cooperation. No dispute or negotiation has taken place. The discussions have always dealt with work methods and technical details in a factual way.

As a summary of the actions and circumstances which in my opinion have essentially contributed to the, hitherto, successful result of this installation on MTM based standard data, I wish to list the following points.

1. The union was informed of MTM in general. MTM was operated on a trial basis in various departments in the company. MTM training had been going on for some time.

2. The contact with the workers took place via the management-employee committee, and a special group participated in the planning of the new workshop.

3. The bio-technological viewpoints were carefully considered in connection with the lay-out work.

4. The thorough testing of machines, tools, and processing data and the personal operating test by the rate setter.

5. The union committee chairman has the function of contact man.

6. The changes for the workers have been radical. It is difficult to make comparisons with previous work methods, since so many things have been changed simultaneously. The whole picture has changed, primarily as a result of the moving of the workshop.

7. The incitement from outside made this a priority operation.

This MTM installation has been realized in a way and with results that have exceeded our expectations. It would not have been possible to advance so far in such a short time without the MTM method and the knowledge in the standard times field imparted to us by the Volvo-Penta Works.

MTM NEWS

SWEDISH MTM ASSOCIATION

2000 Examined MTM Technicians

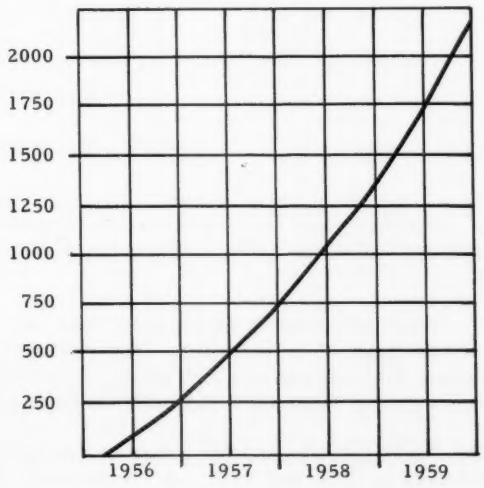
NEWS ITEMS 1

The Swedish MTM Association has from the very beginning spent much interest on the training of MTM technicians. As an important stage in the association's endeavours for increased knowledge of MTM and a correct application of the system in the Swedish industry a large part of the resources has been dedicated to prepare necessary training material, to establish standards of knowledge and to work out examination tests for the complete MTM training. More than 80 MTM instructors have been trained and manuals for the instructors have been worked out.

These MTM instructors are in their turn working on MTM training within the various industries according to the curriculum established by the association. The complete MTM course comprises minimum 200 hours divided into about 120 hours theoretical instruction and about 80 hours practical application training. During the theoretical part the origin and development of MTM are dealt with as well as the different basic motions, how to make a MTM-analysis and the use of MTM for methods work, standard data and time formulas. During the practical part of the course the participants are making MTM analyses, mainly through direct observation in the workshop. This practical training is of utmost importance in order to enable the MTM technician to use MTM in his work after completion of the course.

These courses are completed with a test. In order to follow up the level of knowledge with the trained MTM technicians the association has tried to establish certain standards of knowledge and thus worked out examination tests for the complete MTM course. The MTM instructors can order the test papers from the association. The members of the course who are passing the final test are then given the MTM technician's certificate.

The first examination of this kind took place in the spring 1956. As apparent from the figure below the number of examined MTM technicians was well over 300 after one year.



Number of examined MTM technicians

The interest in MTM has increased successively and therefore the instruction has also been intensified.

The total number of MTM technicians examined by the Swedish MTM

Association is now more than 2000. This means that the number of examined MTM technicians has increased by nearly 55% in less than 11 months. Everything also indicates that the rate of increase will not be less during the next year. During 1959 nearly 40 new MTM instructors have been examined. These will in their turn take care of the training of more and more MTM technicians.

Of the different categories of personnel within an enterprise which have hitherto attended the complete MTM application course and passed the examination, about 44% are work study technicians. As shown in the table above also other groups within the enterprises have received complete MTM training. The group "others"–about 26%–contains partly such persons as can not directly be referred to the categories mentioned and partly such persons for whom complete statements are missing.

The training of others than the work study technicians is no doubt very essential. The best result of a MTM installation can be obtained only if there exists a knowledge of MTM so that a cooperation can be achieved between all the groups within the enterprises which have an influence on the forming of the work methods.

Percental distribution November 1st 1959 of examined MTM technicians in regard to occupation:

Management	about 6%
Work study management	" 24%
Work study personnel	" 20%
Designers (tools-products)	" 6%
Foremen, instructors	" 9%
Workers	" 9%
Others	" 26%

Beyond this complete MTM training also a lot of information has been given within the industry. This information can vary all the way from a short survey of 3-4 hours to a more extensive one of 3-4 days.

The knowledge within the industry of MTM and it's use is in this way increasing. As a consequence hereof also more and more industrial enterprises are going in for this technique in connection with productivity increase and work measurement.

December 1959 Olle Hasselqvist

NEWS ITEM 2

REPORT ON 1959 SURVEY

MTM AT COLLEGES AND UNIVERSITIES

Recently, the MTM Association completed a survey of colleges and universities inquiring into the extent to which MTM has become a part of the Industrial Engineering or Management curriculum.

Some fifty survey forms were sent out. The response to the Association inquiry was good with a return from 46 universities. The total number of schools offering curricula in Industrial or Management Engineering is about sixty. The data from the recent survey can be considered meaningful, since the data represents information from over 2/3 of the colleges and universities.

Forty schools or 87% indicated that MTM was a part of their curricula. Similar surveys were conducted in 1954 and 1957. A comparison of these surveys is shown in the following table:

	1954	1957	1959
As a separate course of study	17.2%	27.6%	13.0%
As a part of a more general course	79.3	90.5	85.0
As an informal lecture or discussion	17.2	9.5	9.0
As a clinic or conference	17.2	9.5	9.0

The most widespread use of MTM was as part of a more general course of study. An interesting point is the fact that MTM was usually discussed in these courses along with the general

subject of Standard Data and usually one or two other predetermined motion time systems. The significant point is that no other system has been as consistently included as MTM.

The following charts show comparisons of the survey with respect to hours spent on MTM in the courses and also the range in hours:

Average Hours

	1954	1957	1959
As a separate course	47.0 hrs.	58.0 hrs.	33.3 hrs.
As part of a general course	20.1	12.0	7.4
As an informal lecture or discussion	1.2	2.0	2.0
As a clinic or conference	29.8	30.0	10.0

Range in Hours

	1954	1957	1959
As a separate course	36-60 hrs.	34-12C hrs.	10-60 hrs.
As part of a general course	5-39	1/2-36	1-20
As an informal lecture or discussion	1-2	1-3	1/2-4
As a clinic or conference	3-66	6-15	----

It is important to remember that the number of hours listed for regular courses refers to classroom hours and does not usually include homework or laboratory work. This breakdown indicates that the student is receiving a considerable amount of orientation in MTM principles, more than would be expected on a purely appreciation level. In fact, the consensus of schools replying was that the student is achieving a competence great enough to make some immediate use of his knowledge of MTM, at least in the various applications to methods work. None of the schools, however, claimed that their students were completely trained in MTM, but, in varying degrees were given a thorough academic introduction to it.

The numbers of people being reached in college and university instruction is as follows:

Average Number of Students

	1954	1957	1959
As a separate course	15.0	23.0	41.0
As a part of a more general course	45.2	60.6	52.5
As an informal lecture or discussion	86.0	122.0	56.0
As a clinic or conference	74.0	4.0	30.0

Range in Number of Students

	1954	1957	1959
As a separate course	8-20	10-50	5-110
As part of a general course	10-20	3-300	5-160
As an informal lecture or discussion	19-200	70-200	40-75
As a clinic or conference	10-183	15-55	----

One final point. The approximate total of all students participating in these activities was 2500—a considerable increase over the year 1957, which showed an approximate total of 1650. These figures are, of course, for a one-year period by which we can again make the hypothesis, that the vast majority of Industrial or Management Engineering students receive orientation and possibly training in MTM.

ANNOUNCEMENT

EVENT	Cornell University Industrial Engineering Seminars
SPONSOR	Department of Industrial and Engineering Administration, Sibley School of Mechanical Engineering, Cornell University
PLACE	Cornell University, Ithaca, New York
TIME	June 14 through June 17, 1960
SEMINAR GROUPS	Participants enroll in one of the following seven groups and also attend general session. A. Industrial Management B. Engineering Administration C. Operations Management of the Smaller Company D. Work Measurement E. Systems Simulation Using Digital Computers F. Statistical Decision-Making: Theory and Applications G. Statistical Reliability Analysis: Theory and Applications
DISCUSSION LEADERS AND SPEAKERS	Specialists from both industry and the staff of Cornell University
FOR WHOM	Operating management personnel in line supervision and staff positions in industrial engineering, production engineering, engineering administration, research and development, quality control, production control, cost control, materials control, purchasing, and data processing.

For additional information write:

J. W. Gavett, Seminars Coordinator
Department of Industrial and Engineering Administration
Upson Hall
Cornell University
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RESEARCH REPORTS

R.R. 101 Disengage

This report contains a preliminary study of the element disengage. While it is still classified as tentative, the report contains some extremely interesting conclusions on the nature and theory of this element.

R.R. 102 Reading Operations

The first step in the use of MTM for establishing reading time standards is contained in this report. In addition, the report contains a synopsis of the work done in this field by 11 leading authorities.

R.R. 104 MTM Analysis of Performance Rating Systems

A talk presented at the SAM-ASME Time and Motion Study Conference, April 1952. It contains an analysis of performance rating systems and various performance Rating Films from an MTM standpoint.

R.R. 105 Simultaneous Motions

This report represents almost two man-year's work on a study of Simultaneous Motions. It is a final report of the Simultaneous Motions project undertaken by the MTM Association. While it does not purport to provide complete and exhaustive answers to all problems in the field of Simultaneous Motions, it presents a great deal of new and valuable information which should be of interest to every MTM practitioner.

R.R. 106 Short Reaches and Moves

This report contains an analysis of the characteristics of Reaches and Moves at very short distances. It develops important conclusions concerning the application of MTM to operations involving these short distance elements.

R.R. 107 A Research Methods Manual

The research activity of the Association has developed an effective and comprehensive set of methods for carrying on research in human motions. This report details the major techniques used. Adequate sources of motion data, film analysis, data recording, and statistical methods of analysis are among the topics discussed.

R.R. 108 A Study of Arm Movements Involving Weight

In this report, the results of a large investigation into the effect of weight on the performance times of arm movements are presented. While more effective means of determining correct time allowances for moving weights are given, the comprehensive discussion of the whole area of weight phenomena is probably of more fundamental importance. The effect of such conditions of performance as the use of one or two hands, sliding vs. spatial movements, and male and female performance are among the topics presented.

R.R. 109 A Study of Positioning Movements

I. The General Characteristics. II. Appendix.
This report, the first of two position reports, defines "positioning movements and the interrelation of component movements." The study is limited to the laboratory analysis, and contains an appendix dealing with several subjects outside the major objectives.

R.R. 110 A Study of Positioning Movements

III. Application to Industrial Work Measurement.
This report, the second on position, relates the results of the position research to the field of application. This study deals with actual industrial operators and work measurement tools, and the evolution of an improved and more efficient technique for controlling and improving manual activity through better understanding of positioning movements.